

What is claimed is:

1. An electrical device comprising
  - (A) an element which
    - (1) has first and second surfaces and
    - (2) comprises a conductive polymer composition, and
  - (B) a first metal foil electrode which
    - (1) comprises
      - (a) a first surface having (i) a center line average roughness  $R_a$   $\mu\text{m}$ , and (ii) a reflection density RD, the product  $R_a$  times RD being 0.5 to 1.6  $\mu\text{m}$ , and
      - (b) a second surface, and
    - (2) is positioned so that the first surface of the electrode is in contact with the conductive polymer element.
2. A device according to claim 1 wherein  $R_a$  is 0.5 to 2.7  $\mu\text{m}$  and RD is at least 0.5.
3. A device according to claim 1 wherein the conductive polymer composition comprises a polymeric component and dispersed therein a particulate conductive filler.
4. A device according to claim 3 wherein the polymeric component of the composition comprises a polyolefin or a fluoropolymer.
5. A device according to claim 1 wherein the conductive polymer composition exhibits PTC behavior.
6. A device according to claim 1 wherein the first metal foil electrode comprises nickel or copper.

7. A device according to claim 1, wherein the first surface of the first metal foil electrode comprises nickel.
8. A device according to claim 1, further comprising a second metal foil electrode positioned so that the conductive polymer element is sandwiched between the first metal foil electrode and the second metal foil electrode.
9. A device according to claim 1 wherein the device is a circuit protection device which has a resistance of at most 100 ohms.
10. An electrical device comprising
- (A) an element comprising a conductive polymer composition, and
  - (B) a first metal foil electrode which
    - (1) is produced by
      - (a) providing a base metal foil having a first surface having a center line average roughness  $R_a$  of at most 0.45  $\mu\text{m}$ , and
      - (b) depositing material to provide protrusions onto the first surface of the base metal foil,
    - (2) comprises
      - (a) a first surface having (i) a center line average roughness  $R_a$   $\mu\text{m}$ , and (ii) a reflection density RD, the product  $R_a$  times RD being at least 0.14  $\mu\text{m}$ , and
      - (b) a second surface, and
    - (3) is positioned so that the first surface of the electrode is in contact with the conductive polymer element.
11. An electrical device comprising
- (A) an element comprising a conductive polymer composition,

- (B) a first metal foil electrode which comprises
    - (1) a first surface which is attached to the conductive polymer element and has
      - (a) a center line average roughness  $R_a$   $\mu\text{m}$ , and
      - (b) a reflection density RD, the product  $R_a$  times RD being at least  $0.14 \mu\text{m}$ , and
    - (2) a second surface, and
  - (C) a crosslinking agent positioned between the first electrode and the conductive polymer element.
12. A device according to claim 11, wherein the conductive polymer composition exhibits PTC behavior.
13. A device according to claim 11, wherein the crosslinking agent comprises dicumyl peroxide.
14. A process for making an electrical device, said process comprising
- (A) providing an element comprising a conductive polymer composition,
  - (B) providing a first metal electrode having
    - (1) a first surface having a center line average roughness  $R_a$  and a reflection density RD such that the product  $R_a$  times RD is at least  $0.14 \mu\text{m}$ , and
    - (2) a second surface,
  - (C) positioning at least one crosslinking agent between the conductive polymer and the first surface of the first metal electrode, and

- (D) securing the first surface of the metal electrode to the conductive polymer element with the crosslinking agent therebetween.
15. A process according to claim 14 wherein the crosslinking agent is activated concurrently with the securing process.
16. A process according to claim 14 wherein the crosslinking agent is activated by thermal or radiation means.
17. An electrical device comprising
- (A) an element comprising a conductive polymer composition and
  - (B) in contact with the element, a metal electrode comprising
    - (1) a base metal foil and
    - (2) first and second surfaces, said first surface comprising
      - (a) protrusions having a maximum height of 1  $\mu\text{m}$  and
      - (b) a reflection density RD of at least 0.6.
18. A device according to claim 17 wherein the metal electrode is produced by a process comprising
- (A) providing a base metal foil having first and second surfaces, and
  - (B) pulse plating metal deposits onto at least the first surface of the foil using a pulse frequency of 10 to 1000 Hz.
19. A device as in claim 17, wherein the base metal foil comprises copper or nickel and the metal deposits comprise copper or nickel.
20. An electrical device comprising
- (A) an element comprising a conductive polymer composition and

(B) a metal electrode, the metal electrode comprising

(1) a base metal foil,

(2) a first surface which

(a) comprises dendritic metal structures, and

(b) is in contact with the element, and

(3) a second surface.

21. A device according to claim 20 wherein the metal electrode is produced by a process consisting essentially of

(A) providing a base metal foil having a first surface and a second surface, and

(B) depositing dendritic metal structures onto at least the first surface of the base metal foil by electrodepositing metal under diffusion limited conditions.

22. A device according to claim 20, wherein the base metal foil comprises copper or nickel and the metal dendrites comprise copper or nickel.

23. An electrical circuit which comprises

(1) a source of electrical power;

(2) a load; and

(3) a circuit protection device according to claim 1 electrically connecting the source and the load.